

Unit 13
Day 4
Inverse of a Function

QUICK QUIZ:

Name _____
Date _____

$$f(x) = \frac{1}{x-6} \quad g(x) = \frac{8}{3x}$$

Find:

1) $f + g$

2) $\frac{f}{g}$

3) $f \circ g$

To find the inverse, switch the roles of x & y

Ex1: $P = \{(2,4)(1,1)(-3,9)(0,0)(-5,25)\}$

Inverse: $P^{-1} = \{(4,2), (1,1), (9,-3), (0,0), (25,-5)\}$

Domain of Inverse: $D: \{4, 1, 9, 0, 25\}$

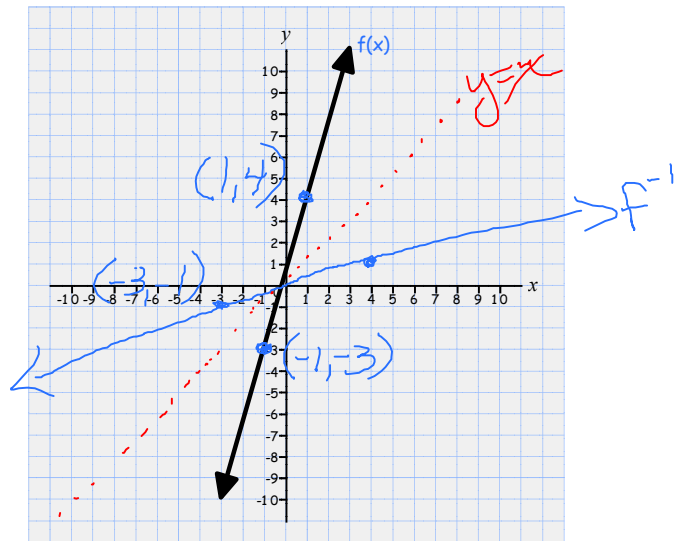
Range of Inverse: $R: \{2, 1, -3, 0, -5\}$

The inverse of $f(x)$ is denoted by $f^{-1}(x)$. State the domain and range of each. The domain of $f(x)$ is the range of $f^{-1}(x)$ and vice versa.

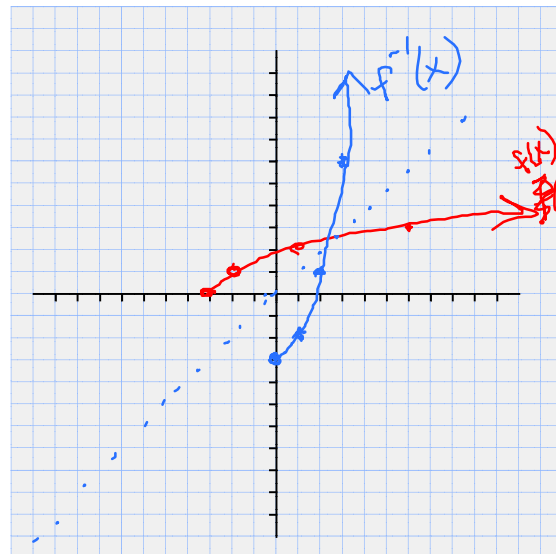
Find $f^{-1}(x)$.

$f(x) = 3x + 2$ $D = (-\infty, \infty)$ $R = (-\infty, \infty)$ $X = 3Y + 2$ $X - 2 = 3Y$ $Y = \frac{X - 2}{3}$ $f^{-1}(x) = \frac{x - 2}{3}$ $D: \mathbb{R}$	$f(x) = x^3 - 5$ $D: R: = \mathbb{R}$ $X = Y^3 - 5$ $X + 5 = Y^3$ $\sqrt[3]{X + 5} = Y$ $f^{-1}(x) = \sqrt[3]{x + 5}$ $D: \mathbb{R}$	$f(x) = \sqrt{x + 3}, x \geq -3$ $D: [-3, \infty)$ $R = [0, \infty)$ $X = \sqrt{Y + 3}$ $X^2 = Y + 3$ $Y = X^2 - 3$ $f^{-1}(x) = x^2 - 3$ $D: [0, \infty)$ $R: [-3, \infty)$
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Graph the inverse of $f(x)$



$$f(x) = \sqrt{x+3}, \quad x \geq -3$$



f^{-1} is a function if and only if (iff) f is one-to-one

How to determine if a function is one-to-one.

- * If the function is a set of points, the points may **not** have repeated **x or y values**.
- * If the function is an equation, solve for x and if \pm results then the function is not one-to-one.
- * If the function is graphed, use horizontal line test.

Are the functions one-to-one?

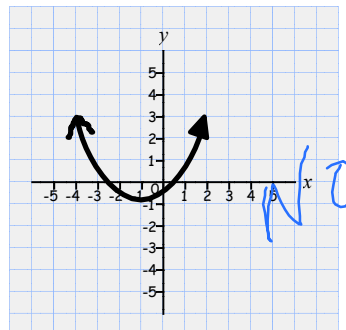
Ex2: $m = \{(3,7)(-2,4)(1,-3)(-6,8)(0,5)(9,-2)\}$

yes

Ex3: $y = \sqrt{5 - x^2}$

$$\begin{aligned} y^2 &= 5 - x^2 \\ y^2 - 5 &= -x^2 \\ -y^2 + 5x^2 &= 0 \\ \pm\sqrt{-x^2 + 5} &= x \\ \text{No} \end{aligned}$$

Ex4:



For the function, determine if it is one-to-one. If so, write an equation for the inverse. State the domain and range of the function and its inverse. Graph both.

$$y = 3x + 2$$

$$y - 2 = 3x$$

$$\frac{y}{3} - \frac{2}{3} = x$$

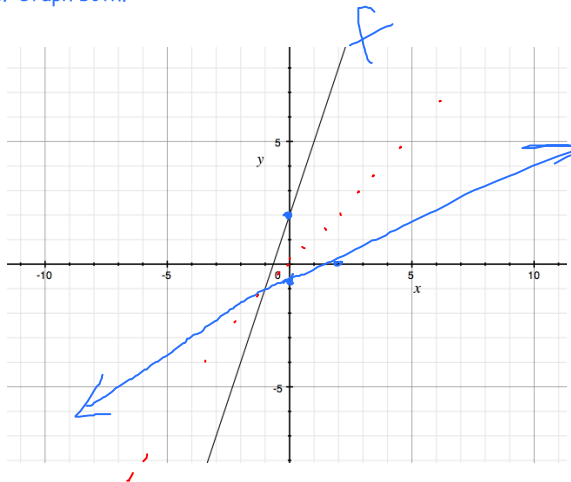
f^{-1}

$$x = 3y + 2$$

$$x - 2 = 3y$$

$$y = \frac{x}{3} - \frac{2}{3}$$

$$f^{-1} = \frac{x}{3} - \frac{2}{3}$$



For the function, determine if it is one-to-one. If so, write an equation for the inverse. State the domain and range of the function and its inverse. Graph both.

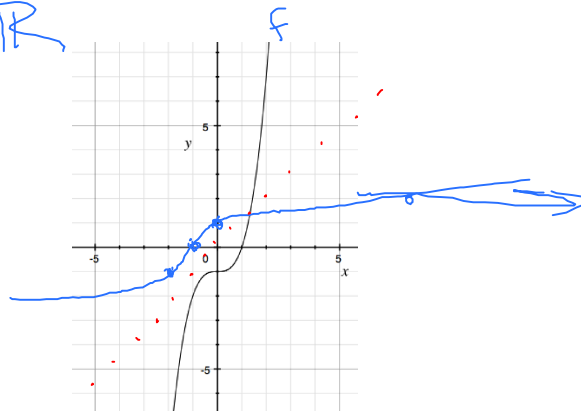
$$y = x^3 - 1 \quad \text{D: } \mathbb{R} = \mathbb{R}$$

$$x = y^3 - 1$$

$$x + 1 = y^3$$

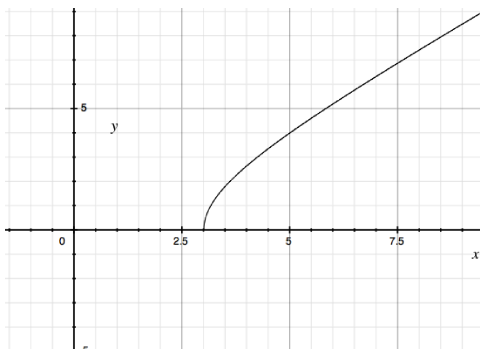
$$\sqrt[3]{x+1} = y$$

$$f^{-1} = \sqrt[3]{x+1}$$



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$$y = \sqrt{x^2 - 9}$$



HOMEWORK:

UNIT 13 DAY 4

p 355-7: 13-26, 61-70